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DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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TENTATIVE INSPECTION STANDARDS FOR ANTHRACITE MINES

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

TENTATIVE INSPECTION STANDARDS FOR ANTHRACITE MINES[1/]

Revised March 1944

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INTRODUCTION

These inspection standards have been prepared for use as a guide for the Federal inspection of anthracite mines. They are a revision of "Tentative Inspection Standards for Anthracite Mines," published as Bureau of Mines Information Circular 7231 in January 1943 and used as a guide for Federal inspections. Numerous changes in the original standards have been made, due in part to recognition of shortages of some types of safety equipment due to the war, in part to need of additional standards to cover certain mine conditions and practices, and in part to conditions not foreseen when the original standards were prepared.

Throughout these standards reference is made to determining the methane content of the mine air by using a permissible flame safety lamp. The Bureau has approved various electrical devices for the detection of methane, but it is recognized that new devices for determining the percentage of combustible gases, as well as the percentage of oxygen, might be perfected for general use in mines, and therefore it may be necessary to revise certain standards to include the use of such equipment if and when the device is accepted as being permissible.

About one-fourth of these standards are marked with an asterisk (*) as being of particular importance in preventing accidents in many coal mines; however, failure to carry out the suggestions made in such of the other standards as are applicable may also lead to loss of life.

With continuing change in mining methods, some of these standards may become inapplicable, and further revision will be advisable. Therefore, questions regarding these standards and suggestions regarding new standards should be brought to the attention of the Bureau, so that changes may be made from time to time. Numerous changes proposed by mine operators and by State mining departments have been incorporated in these standards.

In many respects these standards exceed the provisions of the State mining laws, and some may conflict with the laws or safety orders of the State. In cases of conflict, the intent is not to advocate noncompliance with State laws, but to suggest reconsideration of such laws or safety orders.

Although an effort has been made to word these standards so that they may be readily understood, nevertheless a reasonable interpretation should be placed upon them. In numerous cases the words "reasonable," "suitable," and "properly" are used in recognition of the fact that reason and sound judgment are vital in carrying out safety endeavor.

Any unusual hazard noted by an inspector and not covered by these standards will be discussed in the inspection report and effort made to offer suitable recommendation.

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SURFACE CONDITIONS

01. Breaker and Cleaning Plant

01. To minimize fire, health, and accident hazards:

a. All switches and starting boxes should be enclosed.
b. Stoves or other heating devices should be properly and safely installed and of a type that will present the least possible fire hazard.
*c. Thorough cleaning of coal dust and other refuse from the breaker should be done frequently and, if possible, daily.
*d. Coal dust should be allayed with water or other wetting agent at points where large quantities of dust are released, or a dust-collecting system should be installed at such points.
*e. Where coal is dumped at or near air intake openings, provision should be made to prevent the dust from entering the mine.
f. Coal dust should be kept from accumulating in or about any surface building as far as possible.

02. Men working in or about breakers or cleaning plants should:

*a. Wear goggles if exposed to the hazard of flying particles.
*b. Wear suitable approved respirators when working in dusty atmospheres.

03. Electric or acetylene welding or cutting in breakers or cleaning plants should be done preferably when the plant is idle; a fire extinguisher or container of clean dry sand or rock dust should be readily available; and combustible surroundings should be wetted down before and after welding or cutting.

*04. Where coal is treated with oil or other inflammable or harmful solutions, men exposed to the mist should wear suitable approved respirators, and sources of ignition should be kept at safe distances from the spray.

02. Mine Refuse Disposal

01. Mine waste should be stored so as not to present fire, fume, or slide hazards as far as practicable.

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02. The waste dump should be fenced or protected by police or watchmen where there is a possible hazard to persons, especially children, or to animals.

*03. Persons should not be permitted to live or work in buildings imminently endangered by fire, fume, or slide hazards from waste dumps.

03. Head Frame

01. A railed platform should be provided at head sheaves.

02. The stairway leading to the sheave platform should be provided with handrails. Where ladders are used, they should be provided with substantial back guards.

04. Hoisting

01. Machinery should be so placed that the noise from it will not prevent the hoisting engineer from hearing signals.

02. Hoisting engineers, whose duties in part are to hoist and lower men, should be physically fit and should undergo physical examinations at least annually to determine their continued fitness. A physician's report of such examination should be kept at the colliery.

*03. Unless the hoist is equipped with automatic overwind and overspeed and automatic stop controls that are tested daily, a second engineer should be in attendance while men are being hoisted or lowered.

04. An empty cage or trip should be hoisted in any shaft or slope where the engine has been standing idle 1 hour or more before men are hoisted or lowered.

*05. Hoist motors or engines should be of sufficient horsepower to hoist a fully loaded unbalanced cage or trip, and the hoists should be equipped with brakes capable of stopping and holding the fully loaded unbalanced cage or trip of cars at any point in the shaft or on the incline.

*06. An accurate and reliable indicator of the cage or trip position should be so placed as to be in constant view of the engineer.

07. Drum guides or flanges should be high enough to prevent the rope from slipping off the drum.

*08. Hoisting equipment should be inspected daily and a record made of such inspection.

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09. Sheaves should be inspected daily and kept properly lubricated, but these operations should not be done while the sheaves are in motion. The hoisting engineer should be advised by the inspector or oiler, in person, before and after the work is done. A record of the inspection should be kept.

10. A hoisting rope should be adequate in size to handle the load with proper factor of safety, as defined in wire-rope standards.

11. The rope should make at least three full laps on the drum when extended to its maximum distance and should make at least one full lap on the drum shaft or around a spoke of the drum, and the end should be fastened securely by means of clamps.

12. The rope should be fastened to its load by a socket filled with suitable metal, preferably zinc (spelter), or by a thimble and clamps or clips; the rope should be resocketed at least every 6 months. Where resocketing is done, not less than 4 feet should be cut off the end of rope, so that a new section of rope will will be on the sheave when the cage is at the loading position.

13. Bridle chains that serve as a secondary safety connection between the rope and the cage should be provided.

14. A rope should not be used for hoisting men:

a. Which shows more than six broken wires in any single pitch length or lay of rope.
b. When the wires in the crown of the strand are worn to less than 65 percent of their original diameter.
c. When inspection indicates a dangerous amount of corrosion or distortion.

*15. A record should be kept of the length of service of, or tonnage hoisted by, each hoisting rope, and the rope should be replaced as soon as there is evidence of undue weakness or other conditions which indicate that the rope may fail.

*16. Ropes, links, chains, and rope sockets should be examined carefully by a competent person at least every day they are used, and records should be kept of such inspections.

17. Rollers used on slopes or inclines should be of sufficient length, properly alined, and kept in good repair.

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18. At least two independent methods of signaling (one of which should be audible) should be provided on all landings in shafts or slopes.

19. One of the signal devices at the surface and at each intermediate landing should be so located that it can be reached from the cage or car; or, at times other than when workmen are regularly hoisted or lowered with a topman and a footman on duty, a prearranged understanding should be had with the hoisting engineer before men are handled.

20. The signal code in use at the mine should be posted prominently in the engine room in easy sight of the hoisting engineer and at all places where signals are given.

05. Cages and Shafts

*01. Cages used for hoisting men should be of substantial construction, kept in good repair, and provided with:

*a. Adequate steel bonnets.
*b. Adequate side protection.
*c. Safety endgates.
*d. Handholds.

*02. Cage safety catches that act quickly and effectively in an emergency should be provided, and they should be tested at least every 2 months and a written record kept of the test; where practicable, a drop test should be made. If it is not practicable to make a drop test of cages used for handling men, safety catches should be inspected daily.

03. Serious consideration should be given to equipping shaft-landing chairs at intermediate landings with automatic signals to indicate to the engineer the position of the landing chair, whether out in the shaft or back in the "clear." In addition, the levers that operate the landing chairs should be equipped with locking devices to secure them in the "clear" position when they are not in use.

04. Cages, guides, and shafts should be inspected daily and maintained in good condition. Records of such inspections should be kept.

05. Any opening in the cage floor should be covered when men are handled.

*06. Wood-lined shafts should be fireproofed; if it is not practicable to fireproof them, adequate protection should be provided against fire.

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*07. A cager should be in charge at the top and one at the bottom of the shaft during periods when men are regularly handled. A cager riding the cage and giving the signals meets this recommendation. At times other than when men are regularly handled, with a topman and a footman on duty, a prearranged understanding should be had with the engineer.

08. Provisions should be made to prevent crowding and pushing where men are handled at shafts, slopes, and man-trip loading stations.

*09. Shafts should be equipped with safety gates at the top and at any intermediate landings. The gates should be so constructed that materials will not go through or under them and into the shafts. This does not mean that gates should be of solid construction, which might obstruct the ventilation at these places.

10. Positive stopblocks or derails should be placed at shaft landings.

*11. Tools or other material should not be carried in the cage with men; however, this should not apply to equipment and repair material requiring attendants.

12. The speed of cage when hoisting or lowering men should not exceed 900 feet per minute.

13. Run-arounds should be provided for travel at the foot of shafts and at all intermediate landings. The run-around should not be less than 5 feet high and 3 feet wide.

14. While engaged in repair work in or above shafts, all workmen should wear safety belts. When a platform is being used, a second or safety platform should be placed not more than 10 feet beneath the working platform.

06. Steam and Compressor Plants

01. All boilers should receive at least one internal inspection annually by an authorized inspector, and a written record of such inspection should be kept.

02. A safety-valve escape should not discharge lower than 7 feet above the floor; preferably the discharge should be piped to the outside of the building.

03. At least two safe means of exit from all parts of the boiler room should be available, and the doors should open outward or sidewise, preferably outward.

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04. A stairway or fixed ladder should be provided to give easy access to the top of boilers or runways between boilers.

05. A fusible plug that will open at a temperature of 50° less than the flash point of the lubricating oil in use should be placed in the main discharge line of compressors and as near the compressor as possible; or an equivalent protective device, such as a thermostat, should be used.

06. Main compressed-air receivers should be equipped with safety or relief valves and drain valves.

07. Compressed-air receivers should be inspected at least annually by a competent person, and a written record of such inspection should be kept.

08. Suitable gages should be provided for boilers and compressors (steam pressure, air pressure, water, etc.).

07. Wash Houses

01. Wash houses should be provided in accordance with the State law, and they should be:

a. Provided with showers and an adequate supply of hot and cold water.
b. Kept clean and sanitary.
c. Provided with at least two exits.
d. Well-illuminated.
e. Provided with clothes lockers or hangers.
f. Kept well-heated and, if necessary, heating equipment guarded against contact hazard.
g. Properly ventilated.
h. Provided with sanitary toilet facilities.

08. Supply Houses

01. If oil or grease is stored in a building, the building should be of fire-resistant material and provided with a ventilator extending to near the floor level.

02. Material should be stored so that it will not fall or cause a stumbling hazard.

03. Oil and grease should be stored in closed containers separate from other materials and in such manner as not to create a fire hazard.

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09. Lamp House

01. Charging equipment should be guarded and protected against shock and fire hazards.

02. Naphtha used for flame safety lamps should be stored in suitable containers, preferably at safe locations outside the lamp house, with an automatic filler spigot suitably placed within the lamp house.

*03. Flame safety lamps should be of the permissible type.

*04. Flame safety lamps should be properly cleaned, examined, and assembled by a lamp attendant after each period of use. Lamp assembly should again be checked by the person using it immediately before he enters the mine.

05. When not in service, all methane indicators or detectors and flame safety lamps should be in the custody of a competent person responsible for their maintenance and testing.

10. Yards and Material Storage

01. Timbers, ties, and other mine lumber, other than 1 day's supply, should not be kept within 100 feet of any mine opening or mine fan if space is available. If space is not available, adequate fire protection should be readily accessible; and all materials, including rails, scrap iron, and other scrap, should be properly stored and piled so that they will not obstruct roadways, will not present stumbling hazards, and will not roll or fall.

02. Roads, paths, and walks should be kept free from obstructions and should be well-illuminated if used by night shifts.

11. Surface Fire Protection

*01. All buildings within a radius of 100 feet of mine openings should be of fireproof or fire-resistant construction. If existing buildings within 100 feet of openings are not of fireproof or fire-resistant construction, fire doors should be erected at effective points (in shafts, drifts, or slopes) where smoke or fire from outside sources may endanger men working underground. These doors should be tested at least every 3 months to assure effective operation.

*02. Adequate fire protection should be provided. Fire-fighting equipment should be readily accessible and the location of such equipment plainly marked.

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03. If municipal fire-department facilities are available, fire-hydrant couplings should be standard and interchangeable with those of municipal fire departments, or suitable adapters should be provided.

*04. Fire-fighting equipment should be inspected and tested at least every 6 months and records made of such inspections.

05. A fire-fighting organization should be maintained, and, if feasible, fire drills held at least twice a year.

06. Tight metal receptacles should be provided for oily waste.

*07. Smoking in or about surface structures should be restricted to places where it will not create a fire or explosion hazard.

12. Miscellaneous Surface Conditions

01. Good housekeeping should be practiced in all buildings and structures and about the colliery yards.

02. Passageways and places where men work should be well-illuminated.

03. Surface buildings should be well lighted and heated, if necessa

04. Surface stairways should not be set on angles of more than 45° with the horizontal if space is available. If the stairways are set on angl of more than 45°, they should be provided with proper guards.

*05. Stairways should be provided with safe handrails and kept in good repair.

06. The treads of stairways should present minimum slipping haza and be of uniform construction and spacing.

07. Clearance over stairways should be at least 6-1/2 feet. If adequate clearance cannot be obtained, illumination, or warning signs or devices should be provided.

08. Permanent ladders should be provided with guards if necessar

*09. Openings in floors should be provided with toeboards and railings.

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MINING METHODS, CONDITIONS, AND EQUIPMENT

13. Timbering

01. The timbering rules and safe timbering practices should be strictly enforced.

*02. An adequate supply of props, timbers, prepared cap pieces, and wedges, or material necessary for the same, should be provided convenient to the faces and other places of use.

*03. Miners should examine their working places thoroughly and make them safe before beginning work.

04. Every qualified miner should be instructed in the proper methods of testing roof, ribs, and face, including the vibration method.

*05. Exposed roof in every active working face should be tested at frequent intervals.

06. Miners, mining-machine operators, and loading-machine operators should be provided with suitable roof-testing bars for testing the roof, face, and sides; any dangerous condition should be remedied immediately.

*07. Officials should examine exposed roof, ribs, and face in working places visited and roof along haulageways and traveling ways; condition of timbering should also be observed.

*08. Loose coal or rock in places where men are required to work or travel should be removed or supported securely.

09. Before loose roof is taken down, the adjacent roof should be carefully examined and supported if necessary.

10. If loose roof, ribs, or face material is being pried down, a bar of suitable length should be used instead of a pick.

*11. Timbers or props should be set as soon as room is available in working places. Forepoles should be used in working places where the nature of the roof and sides requires their use.

*12. Where conditions make it impossible to set permanent timber, props should be stood before loading is begun.

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13. Where there is danger of coal rolling upon a person after undercutting, it should be spragged by placing blocks in the cut not more than 4 feet apart or by blocking with leaning props.

14. In slopes or inclined shafts and in the main haulageways timber legs or props supporting the roof or sides should be hitched into the ribs or walls. If this is not practicable, substantial guardrails should be placed along the sides or spacers (sprags) placed between the props or legs of timber sets.

15. Props should be set with cap pieces where practicable; the foot of the prop should be hitched into the bottom.

16. Cap pieces should be of adequate thickness and length and at least as wide as the top of the prop. Where it is necessary to use cap pieces, if practicable, they should be at least 18 inches in length and 3 inches or more in thickness.

*17. Miners or other employees should not go under rock or other loose roof material, except to secure it.

18. Broken and decayed timbers should be placed as soon as possi

*19. Timbers or props knocked out by blasting or otherwise should replaced as soon as possible.

20. Where conditions permit in pillar work, break-line props or cribs should be maintained at the loose ends of pillars and stumps.

14. Explosives and Blasting

01. Separate surface magazines should be provided for the storag of explosives and detonators.

02. Detonators should be stored in a separate magazine of incombustible material or the magazine covered with fire-resistant material and located not less than 100 feet unbarricaded, or 50 feet barricaded, f a magazine containing explosives.

03. Surface explosives-storage magazines should be:

a. Constructed of incombustible material or covered with fire-resistant material and be reasonably bulletproof.
b. Located in accordance with the American Table of Distances so far as feasible and be not less than 200 feet from any mine opening or vital structure.

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c. Located a safe distance from burning waste dumps.
d. Provided with suitable danger signs properly placed near the magazines.
e. Provided with proper ventilators effectively screened.
f. Provided with proper doors.
g. Kept locked securely at all times when not being used.
h. On suitably drained locations.

04. The area surrounding the magazine for not less than 25 feet, eferably 50 feet, in all directions should be kept free of rubbish, dry ss, or other material of a combustible nature; preferably, this area ld be covered with some material to prevent the growth of grass, sh, and weeds.

05. If the explosives magazine is illuminated electrically, the lamps ld be of vaporproof type, the switch should be located outside the build- , and the wiring should be in conduit.

06. Magazines for distributing explosives or detonators should be e same type of construction as storage magazines and situated not s than 200 feet from any mine opening or vital structure.

07. Not more than 1 day's supply of explosives should be kept in a tributing magazine.

08. Detonators, tools, or materials other than explosives should not stored in an explosives magazine; however, this does not prevent the ring of safety fuse or detonating fuse (used for outside blasting) or sting supplies in any explosives or detonator magazine.

09. Unauthorized persons should not be permitted in any magazine.

10. Only hardwood or nonsparking plastic tools should be used for ening containers of explosives and detonators.

11. Waste paper and empty boxes should not be allowed to accumu- in explosives or detonator magazines.

12. Smoking, and carrying matches and smokers' articles, open e, or open flame should not be allowed in or near any magazine, or e handling explosives or detonators.

13. Containers of explosives or detonators should always be lifted set down carefully, never slid over one another or dropped from one to another.

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14. Deteriorated or damaged explosives or detonators should be destroyed. This operation should be done only by a person who is experienced in this work, preferably a technical representative of a manufacturer of explosives.

15. Vehicles used in surface transportation of explosives should be substantially constructed, have tight bodies with no internally exposed metal, and kept in good working order. Open vehicles should be provided with tarpaulins. The ends and sides of the vehicles should be high enough to prevent containers from falling or rolling off.

16. State or other regulations as to marking vehicles transporting explosives should be complied with. If no laws or regulations are in effect any such vehicle should be placarded on each side and rear with the word EXPLOSIVES in letters not less than 3 inches high or should display a red flag with the word DANGER in white letters not less than 6 inches high.

17. Unauthorized persons should not be permitted to ride on vehicles transporting explosives, and the driver and helper should not smoke or carry matches or lighters.

18. A vehicle containing explosives should never be left standing or unloaded until the motor has first been stopped and the brakes set securely and should never be taken into a garage or repair shop. Explosives cases should never be left immediately back of the exhaust, as a spark may start a fire or cause an explosion.

19. Explosives or detonators should never be left unattended until they are placed in a magazine and the magazine is locked or are delivered to someone authorized to receive them.

20. Records should be kept of all explosives and detonators received, stored, and issued.

*21. Individual boxes (such as those of wood, plastic, or pressed-fiber) or receptacles (such as rubberized or leather bags) used to carry explosives or detonators into mines should be closed and constructed substantially of nonconductive material and maintained in good condition.

22. When explosives and detonators are transported underground by locomotive, rope, or belt:

*a. They should be in specially designed cars or in specially designed containers:

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(1) The bodies of such specially designed cars should be constructed substantially of nonconductive material and should be fully insulated. Insulated couplings should be used to complete full insulation if necessary. When cars contain explosives or detonators, they should be locked or attended at all times.

(2) Specially designed containers should be of wood approximately 2 inches in thickness; they should be fully insulated and locked securely when not attended.

*b. If explosives and detonators are hauled in the same explosives car or in the same specially designed container, they should be separated by at least a 4-inch substantially fastened wooden partition or the equivalent.

23. When feasible, the supply of explosives should be delivered on e off shift or between shifts.

*24. Explosives or detonators should not be carried on the same ip with workmen or by the same person at the same time.

*25. Trips carrying explosives should not be hauled into or out of a ine within 5 minutes preceding or following man-trips. When traveling ith the air current, the explosives trip should precede; if against the r current, the man-trip should precede.

26. Explosives and detonators for use at the faces should be kept separate boxes or in well-constructed two-compartment boxes having ell-fastened, adequate separating partitions of wood not less than 4 ches in thickness. These boxes should be kept at safe locations re- ved from the working faces, and tools or other materials should not tored with explosives or detonators. The quantity of explosives kept a miner's box should be limited to as nearly 24 hours' supply as possi- e. In pillar work the foreman should designate a safe place where ex- sives should be kept.

27. In underground operations, explosives and detonator boxes uld be:

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a. Placed in a crosscut (heading) or abandoned chamber or breast neck as far away from the roadway as to be safe; at least 25 feet from trolley or power wires; in a comparatively dry place; and at least 10 feet from the tracks where space is available.
b. Kept locked at all times, except when explosives supplies are being placed in them or removed.
c. Protected from falls of roof.
d. Constructed substantially and, if of metal, with electrically nonconducting lining.

28. Only permissible explosives should be used for blasting coal o rock. All shots in coal should be fired with permissible shot-firing units if it is possible to procure them; whenever feasible, shots in rock should be fired with permissible shot-firing units. In anthracite mines permiss ble explosives are recommended, owing to their greater factor of safety as compared with other explosives used in blasting coal or rock.

29. Shots should be charged and fired only by authorized persons.

30. Where coal is blasted off the solid in breasts in pitching veins, not more than one-half the face should be blasted at one time, where feasible, so that the face can be approached by way of the opposite manwa

31. Where coal is blasted off the solid in chambers in comparatively flat veins, where the roof is weak or broken, and where feasible, n more than one-half the face should be blasted at one time, so that examinations can be made from the opposite side.

32. Blast holes should be large enough in diameter to permit charging without forcing or ramming.

33. Blast holes should be cleaned properly before the charge is placed in the hole.

*34. Electric power should be cut off equipment at a face and cut of trailing cables leading to or near the face before explosives are taken to such face, and the electric power should remain off until blasting has be completed.

*35. Each primer should be made up at or near the face where feas ble immediately before loading and in a place removed from tracks, trol wires, power lines, trailing cables, pipe lines, steel ropes, and conveyor pans.

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36. A punch of wood or other suitable material should be used to make the hole in the primer cartridge to receive the detonator.

*37. Explosives should be adequately stemmed, preferably to the collar of the hole; however, in no instance should the stemming be less than 2 feet in length unless the length of the hole is not sufficient to permit that amount of stemming.

38. Only wood tamping bars should be used.

39. Leg wires of electric detonators should be kept short-circuited until ready to be connected to cable or blasting line.

40. A blasting cable or blasting line should be:

*a. Long enough to permit the miner to fire from a place of safety which is out of line of the blast by at least one 90° turn.
*b. Broken and short-circuited a safe distance from the face and kept short-circuited at the battery end until ready to attach to the blasting unit.
c. Staggered as to length at the detonator end to prevent short-circuiting.
d. Wound up after each shot or adequately supported on insulators.
e. Kept away from track, power wires, pipe lines, and other possible sources of active or stray currents.

41. Worn places on a blasting cable or a blasting line should be properly insulated as soon as observed.

42. Separate blasting lines and separate blasting stations should be provided for each working face; blasting stations to be at least 20 feet apart to prevent the possibility of connecting to the wrong line.

*43. In a gassy mine, examinations for gas should be made before and after blasting, and the place should be examined for fire as soon as practicable after blasting in every mine.

*44. A shot should not be fired in any place where methane can be detected with a permissible flame safety lamp or where more than 1 percent can be detected by a permissible electric methane detector.

45. Only the person who places the charge should remove the shunts and fire the shot.

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46. Shots should be fired promptly after charging.

47. Before commencing work and also after the firing of every blas the miner working a breast or any other place in a mine should enter such breast or place to examine and ascertain its condition, and his laborer or assistant should not go to the face of such breast or place until the miner has examined it and found it to be safe.

*48. Ample warning should be given before shots are fired. When two places approach each other closely, the employees of both places should withdraw to safe locations before blasting is done in either place.

49. The use of mudcap or other open, unconfined shots should be restricted to battery starting when no gas or fire hazard is present and only when it is otherwise impossible to start the battery; similarly, the use of unconfined "shake" shots in working places and other places in pitching veins may be permitted when necessary to bring down loose hanging coal that is too hazardous to take down by other means. Only permissible explosives should be used for these purposes.

50. A waiting period of at least 15 minutes should elapse before anyone returns to the face when a misfire occurs in instantaneous electric blasting. After such failure, the blasting cable should be disconnected from the source of power and the battery ends short-circuited before electric connections are examined.

51. Misfires should be handled under the supervision of the foreman or his assistant.

52. Explosives should be removed only by firing a separate charge at least 2 feet away from and parallel with the misfired charge. A careful search should be made to recover the undetonated charge.

53. An accurate record should be kept of the number of misfired shots.

15. Ventilation

01. Ventilating fans should be so located that the return air from a mine cannot be drawn into the intake openings.

02. Main fans should be:

a. Installed on the surface.

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*b. In a fireproof housing. If present installations do not meet this recommendation, such installations should be made fire-resistant.
*c. Provided with fireproof air ducts. If present ducts do not meet this recommendation, they should be made fire-resistant.
d. Offset from nearest side of mine opening. If a new fan is installed or the present fan is moved, the offset distance should be at least 25 feet.
e. Provided with ample pressure-relief or explosion doors. Note: In lieu of provisions d and e, the fan may be located directly in front of or over a mine opening, provided the opening is not in direct line with possible forces coming out of the mine in the event of an explosion, and provided further that there is another opening having a weak-wall stopping or explosion doors that would be in direct line with the forces coming out of the mine if an explosion occurs, such opening to be not less than 25 or more than 100 feet from the fan opening.
f. Equipped in new installations to permit prompt reversal of air flow.
*g. Operated continuously, except when the mine is shut down for an extended period.
h. Provided with pressure-recording instruments.
i. Provided with automatic devices to give alarm, unless the fans are constantly attended; and in case of a gassy mine, provision should be made to deenergize, automatically or otherwise, the underground electrical circuits when the fans slow down or stop.
*j. Inspected daily.

*03. If it is impracticable to install main fans on the surface and if [illegible] fans are installed underground, the surroundings of the fans should be [illegible]-resistant. The fans should be operated continuously, and they should [illegible] inspected at least twice during each 8-hour period, unless the mine is [illegible] down for an extended period.

04. If the main fan of a gassy mine fails or stops for 5 minutes or [illegible]re, the men should be withdrawn from the mine immediately. After the [illegible] has been started, the mine should be examined thoroughly for gas, and [illegible] gas found should be removed before the men reenter the mine. The [illegible]e procedure should be followed in a section of a gassy mine if it is [illegible]ndent on a booster fan.

[illegible]07

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05. If the main fan of a nongassy mine fails or is stopped for more than 30 minutes, the men should be withdrawn from the mine. Before the men reenter the mine after the fan has been started, the mine should be examined thoroughly for gas, and any gas found should be first removed.

06. If stoppage of a main fan of a gassy mine is more than momentary, mine electric power should be cut off from face sections; and if stoppage is for 5 minutes or more, power should be cut off from the entire mine. A thorough gas examination should be made before power is restored.

*07. The area around fans should be kept free of dry grass, brush, and rubbish for at least 100 feet in all directions.

08. A stand-by fan, preferably operated by an internal-combustion or steam engine, should be provided at a gassy mine, when feasible, to serve if the main fan fails.

09. A booster fan should be used only for ventilating a distant extension of a mine if ventilation by improvement of airways is impractical and if the construction of a new ventilation opening is not feasible. If installed for such reason, the fan motor should be of the enclosed type, the surroundings of the fan fireproofed, and the fan so installed and so located with respect to workings as to reduce possibility of recirculation of air. Where feasible, passage by the fan installation should be by means of an air lock, the doors of which should each have at least 30 square feet cross sectional area and open automatically when the fan stops operating. Under these conditions standards 15-03-04-05 and 06 apply.

*10. Auxiliary fans or blowers with tubing should not be used unless approved methods of ventilation are impracticable. When used, they should be installed in intake air and powered with permissible driving units and located to avoid recirculation. The surroundings of the fans should be fire resistant. The fans should be operated continuously and inspected at least twice during each 8-hour period in a gassy mine, unless the mine is shut down for an extended period.

11. A split ventilating system utilizing air bridges (overcasts or undercasts) should be used instead of doors for conducting ventilation in all passageways where feasible.

12. The quantity of air (in cubic feet a minute) in any split, circulating through the last open crosscut, should be at least 200 times the number of men and 500 times the number of haulage animals working in the section as much more as may be required.

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*13. The quantity of air reaching the last open crosscut between gangway and airway or the maximum inby point of the split should be at least 6,000 cubic feet a minute if practicable.

*14. The quantity of air reaching the face of each working place should be at least 200 cubic feet a minute for each man working in the mine and as much more as may be required to dilute, render harmless, and sweep away noxious or dangerous gases.

15. Airways should be kept clear to permit free passage of air; this includes nonhaulage air courses as well as those utilized for haulage or man travel.

16. The main-intake and main-return air currents in mines should have separate shafts, slopes, or drifts. It is recognized that some present anthracite mines use the same shaft for intake- and return-air currents and that sinking a new shaft or use of other connection is economically impracticable. In such cases the curtain-wall partition should be wholly of fire-resistant material, of substantial construction, and airtight.

17. Haulage and hoisting openings and main haulageways should be ventilated with intake air if feasible. In any event, the air should be known to be [illegible].

*18. The face of any chamber or breast should not be advanced more than 60 feet beyond the nearest open pillar heading or cross heading.

19. Chutes or crosscuts between gangways and airways or headings should be made at intervals sufficient to assure adequate ventilation at faces but not to exceed 80-foot intervals.

20. Headings between chambers, breasts, or chutes, except the one nearest the face, should be closed with stoppings, preferably of gob wall, brick, or tight board.

21. Chambers or breasts should not be worked off any heading, gangway, or roadway in advance of the last crosscut or chute between the gangway and airway, even if line brattices are utilized.

22. Stoppings between intake and return airways should be substantially constructed of incombustible material, except that one temporary stopping of wood may be erected between the last permanent stopping and the last crosscut. Where heavy blasting is done, it may be necessary to erect two temporary stoppings between the last permanent stopping and the last crosscut.

[illegible]7

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23. Stoppings should be completed promptly as passageways are advanced.

24. Trapdoors placed in stoppings should be so hinged or constructed as to be self-closing, tight, and open against the air current.

25. All main doors should have attendants whose constant duty it should be to open them for transportation and travel and prevent them from standing open longer than is necessary for persons or cars to pass through, unless a man precedes trips to open doors and another man follows trips to close doors, or unless a self-acting door is used that is approved by the State mine inspector of the district.

26. Where doors are used in connection with coursing the air in any one split, or if used in lieu of a split ventilation system, they should be:

*a. Installed in pairs to form air locks, which should be ventilated sufficiently to insure against an accumulation of gas within the enclosed area.
*b. Self-closing.
c. Not provided with latches or other devices to hold them open.
d. Set in frames of incombustible material or provided with supplies of rock dust, sand, or chemical extinguishers on each side of doors if the doors are of wood.
e. Hung so that they swing to the clearance side, if feasible.
f. Hung so as to open against the ventilating current.
g. An emergency main door should be provided and kept standing open and so fixed that it can be closed at once if necessary.

27. Line brattice should be:

*a. Used to conduct the air from the last open crosscut to working faces when necessary to remove gases, explosives fumes, smoke, and dusts.
*b. Constructed to provide the most adequate air movement possible and convey sufficient ventilation to the face.

28. The space between the rib and the line brattice should be large enough to permit free flow of air.

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29. Air bridges should be tightly constructed of incombustible [illegible]ial and of ample area to pass the required quantity of air.

30. Where it is not practicable to seal worked-out or abandoned [illegible]s of a mine in operation, these worked-out or abandoned parts should [illegible]entilated so far as practicable. Abandoned parts that are accessible [illegible]ld be carefully examined at least once a week by the mine foreman [illegible]s assistant. Records of these examinations should be kept.

31. In every sealed fire area, or where water is impounded, one or [illegible]e stoppings should be fitted with a pipe or valve to allow sampling of [illegible]ir behind the seals or to provide a means of determining any existing [illegible]static pressure.

32. Ventilation should not be diverted from idle sections to active [illegible]ons to provide an adequate quantity of air for different working shifts.

*33. Working places should not be ventilated by an air current that [illegible]assed through abandoned workings or worked-out parts of a mine. If [illegible]ical conditions are such that ventilation by an air current that has [illegible]ed through abandoned workings or worked-out parts is necessary, [illegible]ite measures, such as increased supervision and frequent tests of [illegible] should be made to assure that the air is at all times of good quality [illegible]free from a gas-ignition hazard.

34. A mine should be classed as gassy when 0.25 percent or more [illegible]ane or other combustible gas can be detected by a systematic search, [illegible]f the mine records establish the fact that methane has been found or [illegible]ted.

*35. If inflammable gas can be detected in the air of a working place [illegible]a flame safety lamp, or if it contains more than 1 percent inflammable [illegible]as determined by an electric methane detector or by chemical analysis, [illegible]ventilation should be improved immediately. If air in the working place [illegible]ains more than 2 percent inflammable gas (slightly less than 1/2-inch [illegible]on a testing or low flame of a flame safety lamp), the workers should [illegible]withdrawn until the ventilation is improved. By "air of a working place" [illegible]eant air not nearer than 1 foot from the face. Air should be tested for [illegible]at such points as conditions may warrant.

*36. If the air immediately returning from a split that ventilates any [illegible]p of active workings contains more than one-half of 1 percent of in-[illegible]mable gas, as determined by chemical analyses in duplicate or by [illegible]r recognized means of accurate detection, the ventilation should be [illegible]proved immediately if at all possible. If this air contains more than

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1-1/2 percent inflammable gas, the workers should be withdrawn until ventilation has been improved.

*37. At least two permissible flame safety lamps should be kept in proper working condition at every coal mine, and at least two persons should be kept well-informed as to the safe maintenance and use of flame safety lamps.

*38. Only permissible methane detectors should be used for making inspections for explosive gas. (Permissible flame safety lamps are considered a type of permissible methane detector).

39. All men required to use methane detectors and permissible flame safety lamps should be thoroughly instructed in their use and limitations.

40. All underground officials whose duties are to test for gas should wear corrective-lens glasses if necessary for good vision.

41. Enough assistant foremen should be employed in gassy mines; they should:

*a. Begin examination of the mine not more than 3 hours before each shift enters the mine.
*b. Examine every working place, all places adjacent to live workings, every roadway and travel way, every unfenced road to abandoned workings, and all accessible falls adjacent to live workings for explosive gas and other hazards.
*c. Leave at or near the face of each place examined their initials and the dates.
*d. Place a danger sign across the entrance to every place where a dangerous condition is found. The danger sign should be removed only by a certified official after the danger has been removed.
*e. Report to a proper official on the surface or at designated underground stations any dangers found before the men enter the mine or pass such designated stations.
*f. Record in ink the results of their inspections in a book kept on the surface for that purpose. Similar records also should be kept at designated underground stations.

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42. All coal mines classed as nongassy should be carefully inspected for methane at least once a month; a record should be kept of the inspection.

*43. The mine foreman or his designated assistant on each shift should read and countersign the assistant foreman's reports of examination preliminary to that shift before the men enter the mine or pass designated underground stations. (The preshift assistant foreman is the mine foreman's designated assistant.) The mine foreman should read and countersign the assistant foreman's reports daily.

44. Air in working places or traveling ways should contain at least 20 percent oxygen and not more than 0.5 percent carbon dioxide, as determined by chemical analyses, and no harmful amount of dust or poisonous gas.

45. Changes in ventilation which may affect the safety of the men should be made when the mine is idle and with no men in the mine other than those engaged in changing the ventilation.

46. Accumulations of gas should be removed under the direct supervision of a foreman or other competent official, and no men should be permitted to work, or electric equipment be operated, on the return of the split while gas is being removed.

47. Air measurements should be made by the mine foreman, his assistants, or other certified officials at least once each week at or near the mouth of the main intake and return of the mine and also in or immediately adjacent to the last crosscut on each air split, at or near the face of each airway or gangway, and at the nearest cross heading or crosscut to the face of the inside and outside chamber, breast, or chute where men are employed. Tests should be made with a permissible flame safety lamp or other methane indicator in such splits and in the main return. Records of these measurements and tests should be kept in a book furnished for this purpose.

16. Surface Haulage

01. Track and roadbed should be maintained in good condition.

*02. There should be a clearance of 30 inches or more on at least one side of the tracks, but if it is not practicable to obtain such clearance at some places, these places should be marked with signs warning of restricted clearance.

03. Frogs, guardrails, and lead rails should be blocked if there is danger of persons catching their feet in them.

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04. Track switches should be complete with throws and bridle bars.

05. Switch throws should be so installed as to provide adequate clearance for switchmen.

06. The rod extending from the bridle bar to the throw should be covered or the stumbling hazard otherwise minimized.

07. Where surface operations require that many persons pass over the haulageway, a warning signal should be installed or an overhead walkw or underpass provided.

08. All track crossings should be provided with warning signs.

09. Crossings on the surface should be guarded while cars are beir moved.

10. Derail devices should be installed where necessary on all side-tracks on the surface near junctions with main lines.

*11. Outside planes or inclines should have:

a. Positive stopblocks at the top.
b. Derails near the top.
c. Derails near the bottom.

12. In handling railroad cars, brakemen should:

a. Use suitable brake sticks, preferably made of metal.
b. Use safety belts where practicable.
c. Wear safety hats.
d. Use railroad-type pinch bars for starting cars.
e. Wear snug-fitting clothing.

17. Underground Haulage

01. Haulage roads should be kept free of coal spillage and debris.

02. The roadbed should be kept well drained and surfaced.

03. Rails should be of sufficient weight to carry safely the heavies rolling stock, and they should be attached firmly to ties that are of adeq size and properly spaced.

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04. On all haulage roads, rails should be connected at the joints by angle bars or plates, or they should be welded.

05. The track should be properly alined and free from high or low joints, broken rails, defective switches, defective frogs, and improperly aligned frogs.

06. Frogs, guardrails, and lead rails should be blocked if there is danger of persons catching their feet in them.

07. Track switches should be complete with throws and bridle bars.

08. The rod extending from the bridle bar to the throw should be covered or the stumbling hazard otherwise minimized.

09. Switch throws should be placed on the clearance side, preferably at shelter holes.

10. Main switches on haulageways should be illuminated with electric lights; however, in gassy mines these lights should not be installed within 150 feet of the end of pillar workings or any open, partly caved, poorly ventilated places unless they are of the permissible type.

*11. Where practicable, there should be a continuous clearance on one side from the mine portals to all working faces of at least 30 inches from the nearest obstruction to the farthest projection of moving equipment.

*12. Clearance should not be obstructed by loose rock or coal, supplies, or other material.

13. At sidetracks there should be a clearance of at least 30 inches between the farthest projection of equipment on any two tracks.

14. Shelter holes should be:

*a. Provided along all haulageways if used as traveling ways.
b. Suitabley marked.
c. On the clearance side where practicable.
d. Not more than 150 feet apart. (Chamber, breast, or chute necks, and crosscuts or breakthroughs, if on the clearance side, may be considered as shelter holes.)
e. Provided at all switch throws where sufficient clearance is not available.

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f. Provided on both sides of all doors where sufficient clearance is not available.
g. Kept clean and free of obstruction.

15. Safety holes, adequate for man shelter, should be provided in safe locations at landings of slopes and planes and should be kept free of obstructions.

*16. Short pieces of rail, ties, or props should not be used to raise or slue derailed cars and locomotives, or for pushing cars or trips.

*17. Locomotives should be equipped with suitable rerailers, jacks, and other necessary tools for rerailing cars or locomotives.

18. If necessary, guards should be installed in the cabs of locomotives, and safety chains or other suitable devices should be provided to prevent motors from falling to the floor or pushing through the tops of locomotives.

19. Insulating mats should be provided for the floor and seat of the locomotive cab.

*20. Internal-combustion engines or steam locomotives should not be used underground.

21. Where two or more locomotives or other self-propelled track-mounted equipment are operated independently on the same track, a block signal system or telephones should be used to control their movement.

*22. Self-propelled track-mounted equipment, including locomotives, cutting machines, and loaders, should be handled carefully and kept under control at all times. Locomotives should be provided with efficient headlights and warning devices. When equipment without headlights is moved into or out of a working place, it should be stopped at any intersection or curve and be preceded by a helper or flagman.

23. Underground hoists should be equipped with brakes adequate for the required service.

24. If underground hoists are used for handling men:

*a. An accurate indicator of the trip position should be so placed as to be in constant view of the hoistman.

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*b. A second hoistman should be in attendance at all times while a man-trip is being hoisted or lowered, unless the hoist is equipped with automatic overwind, overspeed, and stop controls.

*c. No rope should be used which shows more than six broken wires in any single pitch length or lay, or when the wires in the crown of a strand are worn to less than 65 percent of their original diameter, or when inspection indicates a dangerous amount of corrosion or distortion.

d. Signal codes should be posted in the hoist room and at other places where signals are regularly given.

25. Ropes should be of adequate size and strength for the required rvice.

*26. Ropes should be replaced as soon as there is evidence of undue akness or other conditions which indicate that the rope may fail.

*27. Man-trips or man-cars on mechanical or gravity slopes or in- es should be provided with safety ropes or chains connected to the main es at points above the regular hitching, and extending around or through cars. In addition, it is desirable that they be provided with mechanical ices to stop the cars or trips if the main ropes, couplings, or drawbars

28. Ropes, links, chains, and rope sockets should be examined carey at least every 24 hours by a competent person.

29. Drum guides or flanges should be high enough to keep the rope n slipping off the ends of the drum.

30. The rope end should be secured to the drum; it should make one lap around the drum shaft or a spoke of the drum and be secured by ps or clips.

31. The rope should be fastened to its load by a socket filled with able metal, or by a thimble and clamps or clips.

32. Haulage equipment should be maintained in a safe condition.

*33. Sprags, chains, or car blocks should be used on all standing cars, rdless of the grade. If cars have brakes, they should be set. The use ips or small pieces of coal or rock, or similar makeshifts, should not onsidered as adequate blocking.

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34. Effective drags or equivalent positive mechanical devices shou be used on rope trips on ascending grades.

35. On all inside slopes and planes having knuckles, there should b positive-action safety blocks at or above the knuckles.

36. In gangways that rise at and near the faces, standing cars shou be securely blocked, and stopblocks or derails should be placed between t cars at or near the face and the first outby chute or other loading places.

37. Workmen driving places to the dip should be protected by posit stopblocks or derails at the top and positive derails placed at safe distan from the faces. If cars are being loaded or are standing at or near the fa of pitching places, they should be securely held by chains, properly place blocks, sprags, or clevises. (Note to inspector: The effectiveness of the method used should be carefully observed.)

*38. Cars placed for loading in chambers, faces of gangways, and other working places should be effectively blocked. (Note to inspector: The effectiveness of the method of blocking cars under various conditions should be carefully observed.)

*39. Effective methods should be used to control cars while being loaded at chutes and other loading places. (Note to inspector: The effectiveness of the method used should be carefully observed.)

40. Slides or skids should be used on descending grades where the locomotive is not adequate to control the trip.

41. Locomotive headlights should be maintained in good repair.

*42. Efficient electric trip lights should be used on the rear of all trips and on the front of locomotive-pushed trips. Permissible trip lights should be used in gassy mines. Reflector buttons should not be substitute for trip lights.

43. Animals working underground should be provided with permiss electric lights.

44. Pushing of cars or trips by locomotives should be eliminated s far as possible.

*45. Only authorized persons should operate locomotives.

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*46. Riding on locomotives should be prohibited except to those erating the trip and persons authorized by the management.

*47. Riding on top of loaded cars, between cars, on the outside of s, or on bumpers on front of cars should be prohibited. This does apply to mule-hauled trips where car-brake levers are on the front of the cars.

48. Motormen or brakemen should not get on or off cars or trips motion.

*49. When the motorman leaves a locomotive, even temporarily, the verse lever of the control should be set at neutral and the brake set ntly; if the lever is removable, it should be carried by the motorman.

*50. Back-poling should be allowed only at places where the trolley e cannot be reversed and when the locomotive is operated at a very low eed.

*51. Sliding the cable "nip" along the wire should be prohibited.

*52. Flying switches should be prohibited.

53. At least one car should be placed between the locomotive and s or trucks carrying rails or long timbers.

54. Intervals of at least 500 feet should be maintained between all ght" locomotives and all locomotive trips traveling in the same direction, the locomotives should be held to a low speed.

*55. Cars should not be coupled or uncoupled by hand while they are motion, provided, however, that this does not apply to the top or bottom at slopes, planes, or shafts.

*56. Cars in motion should not be coupled or uncoupled by hand from inside of curves.

*57. Locomotives approaching and passing through doors should be rated at reduced speed for at least 100 feet on each side of the door.

*58. Cars and trips should not be left standing in places where they endanger other trips or persons or where they materially obstruct the illating current.

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*59. Motormen, brakemen, drivers, and others should not leave ven lation doors or curtains open.

*60. An official or other authorized person should be in charge of an accompany each locomotive-hauled man-trip.

61. Man-trips should be operated at a safe speed but at no time in excess of 6 miles an hour.

*62. Man-trips should not be operated immediately behind loaded trips on ascending grades or immediately in front of loaded trips on descending grades.

63. Enough cars should be provided on man-trips to permit all me to ride inside and prevent crowding.

64. Men on man-trips should not ride in the car next to the trolley locomotive unless such car is specially designed to afford front-end and overhead protection.

65. When riding in a car on a trolley haulage road, men should rid on the side of the car opposite the trolley wire unless suitably covered m cars are used.

*66. Persons other than the brakeman should not be permitted to r on the rear bumper of a man-trip, and no person should be allowed to ri between cars.

67. The man-trip should come to a full stop before men load or unload.

68. Suitable places with seats should be provided at junction point where men may congregate while waiting for man-trips; they should be where the lives of persons waiting would not be jeopardized by runaway cars or trips or the wrecking of cars or trips.

*69. Only tools and supplies that can be carried entirely inside a separate car should be hauled on man-trips.

70. If there is any hazard of men touching the trolley wire at man trip loading and unloading stations, the power should be cut off while me are loading or unloading; also, the wire should be adequately guarded at these stations.

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71. Barrier gates that close automatically or overpasses or underpasses should be provided at places where traveling ways cross haulageways.

18. Electricity

*01. Overhead high-potential power lines should be placed at least 15 feet above the ground and 20 feet above driveways and should be supported and guarded adequately to prevent contact with other circuits.

02. High-potential power lines should be protected adequately by circuit breakers.

03. The wires of all circuits should be of ample capacity for the current carried.

04. DANGER--HIGH VOLTAGE signs should be placed on all transformer enclosures, high-potential switchboards, and other high-potential installations.

05. Guy wires from poles supporting high-potential transmission lines should be grounded. If insulators are used, they should be installed near the poles.

06. Surface transformers within 15 feet of the ground should be enclosed in a transformer house or by a substantial fence suitably located and at least 6 feet high.

07. The gate or door to the transformer enclosure should be kept locked at all times unless authorized persons are present.

08. Casings of all transformers should be grounded unless protected by isolation (freedom from contact hazard by position or fencing).

09. Switchboards should:

*a. Have ample working space around and back of them, free of rubbish and stored material.
b. Have entrances at each end to permit authorized persons to inspect, adjust, or repair apparatus back of switchboards.
c. Be adequately lighted.
d. Have controls readily accessible for emergency shut-down.
e. Have cut-out switches on incoming circuits.
f. Have entrances to rear guarded.

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*10. Rheostats and electric heaters should be placed safe distances from combustible material and effectively protected against contact and fire hazards.

11. Switches and circuit breakers controlling the operation of stationary motors and electric lighting should be so placed that they are readily accessible and can be reached without danger of contact with moving or charged parts.

*12. Electric wiring in all surface buildings should be so installed a to present minimum fire or contact hazards.

13. All electrical appliances, machines, and conductors should be sufficient in size for the required work.

14. All metallic coverings and armor of cables and all conduit should be grounded and should be electrically continuous to afford a conductor path for the ground current.

15. All metallic frames, casings, and coverings of motors, genera tors, switchboards, and other electrical equipment that can become "alive through failure of insulation or by contact with energized parts should be grounded. (Note to inspector: All electrical equipment having a rated capacity of 15 horsepower or 10 kilowatts or more should be provided wi a frame ground equivalent to No. 0 copper wire. Electrical equipment having a rated capacity less than 15 horsepower or 10 kilowatts should b provided with a frame ground equivalent to No. 6 copper wire.)

16. Where a grounded return system is used, all underground met pipe lines, 1,000 feet or more in length and all metallic pipe lines leadin outside the mine should be bonded to the return at the ends and also at in tervals not exceeding 500 feet.

17. The frames of drills and other electric tools intended to be he in the hands while being operated should be grounded.

*18. Dry wood platforms, rubber mats, or other electrically nonconducting material should be kept in place in front of and around all switchboards, starting switches, and stationary electrical installations underground.

19. Wires or other substitutes that do not provide adequate prote tion should not be used in place of proper fuses.

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*20. Electrical equipment should be protected against excessive overload by fuses or equivalent protective devices of the correct type and capacity.

21. Clean, dry sand or rock dust and, if available, fire extinguishers, suitable from both a toxic and shock standpoint, should be provided and placed outside underground electrical stations so as to be out of the smoke in case of fire in the station.

22. If track is used for the return circuit, both rails should be welded at every joint and cross-bonded at least every 200 feet or at intervals that will assure an efficient return circuit; rail-joint bonds and cross-bonds should be properly installed and maintained in good repair.

23. Instructions on artificial respiration should be posted at every electric station and at or near the entrance to the mine.

24. All employees working with or around electrical equipment should know how to give artificial respiration.

*25. Wiring in underground structures should be insulated and installed properly.

26. Telephone circuits should be protected on the surface by lightning arresters (protector blocks).

27. Trolley and bare power wires should be:

a. Securely supported on insulated hangers not more than 30 feet apart.
b. Kept taut and not permitted to touch the roof, rib, collars, or doorframes.
c. Properly alined.
d. Installed on the opposite side from the clearance side and shelter holes, where feasible.
*e. Sectionalized by proper electric switches at suitable intervals; electric switches should also be installed in all branch lines near their beginning.
f. Provided with cut-out switches where mine cars are stored on idle days.
*g. Adequately guarded where men are required to pass under the wire, unless the wire is 6-1/2 feet or more above the top of the rail.
h. Cut off and anchored with an insulated turnbuckle or a strain insulator at the inby end.

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*28. Power wires, whether bare or insulated, should be supported o or by well-designed and installed insulators. (This does not apply to armored cable carried on metal supports.)

29. Power and trolley wires should be properly guarded on both sides of all doors.

30. Power wires, other than trolley wires, should be properly insulated when passing through doors or stoppings.

31. Power should be disconnected when repair work is being done o electrical equipment and accessories, such as trailing cable, feed wire, trolley wire, switches, junction boxes, and the like.

*32. The ends of trolley or feed wires should not extend beyond the last open crosscut, chute, or heading, and should be kept at least 150 fee from the end of pillars, workings, or any open, partly caved, poorly vent lated places.

33. If feasible, power should be cut off from idle sections of a mine and cut off from the entire mine on idle days. This statement is not, hov ever, intended to bar the use of lines properly protected by fuses or cir- cuit breakers for the operation of units such as pumps, if all passageway and adjoining areas through which live circuits pass, including surround of units, are examined with a flame safety lamp and found free of gas.

34. Underground electrical equipment should be provided with switches of safe design, construction, and installation.

35. Officials, haulage crews, electricians, and others connected with electrical maintenance should be familiar with the locations of cut- switches.

36. Cut-out switches should be marked so that they may be found readily in case of emergency.

37. Circuit breakers should be provided to protect all power circu If they are automatic, they should be set so that the circuits cannot be o loaded; if they are hand-set, the handles should not be tied in place.

*38. Underground electric stations for permanent installations of pumps, hoists, compressors, motor-generator and other conversion eq ment, battery-charging stations, and transformers should be located in well-ventilated fireproof rooms.

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*39. Permanent battery-charging stations should be located on parate air splits, the return from which does not pass through any tive workings. Such stations should be installed in fireproof rooms.

40. The surroundings of temporary battery-charging stations should of incombustible material or should be made fire-resistant.

*41. Telephone service should be provided from the surface to the king sections of a mine 2,500 feet or more distant from the surface.

42. Telephone wires should be installed on the opposite side from wer or trolley wires where at all practicable. If telephone lines are in-lled on the same side as power or trolley wires, they should be pro-ted by insulating transformers.

43. Telephone wires crossing power or trolley wires should be ade-ately insulated.

44. Telephones should be grounded or protected by insulating trans-mers (repeating coils).

45. Signal wires should not carry more than 24 volts. (This does t apply to block-signal systems.)

46. Signal wires should be supported on insulators.

47. Permanent underground stations having transformers filled with lammable oil should be provided with doors which close automatically ase of fire. When practicable, these stations should be on separate splits leading to the return; such stations should be provided with door s, or their equivalent, that will confine the oil in the event of leakage explosion.

*48. Portable transformer stations should be in fireproof housings her fully enclosed or fitted with doors which close automatically in the nt of fire. They should be located only in well-ventilated places.

49. A potential higher than 250 volts should not be used for operating ns or other electric tools intended to be held in the hands. Electric lls or other electrically operated rotating tools intended to be held in hands, and, where feasible, post drills should have the electric switch constructed as to break the circuit when the hands release the switch.

50. Electrically driven equipment that is operated inby the first open ing or crosscut between chambers or breasts, between gangways and

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airways, or in air that has ventilated one or more working places in min classed as gassy should be permissible. It is recognized that under war conditions it may be difficult, if not impossible, to obtain permissible equipment and that nonpermissible equipment is now and will continue to be used in gassy mines. Where such equipment is used, all possible pre cautions should be taken.

51. If nonpermissible electrical equipment is used in face regions (inby first open crosscut or air that has ventilated one or more working places) of gassy mines, it should be operated only under the following conditions:

*a. Each working place should be carefully examined for methane by a certified official or other competent person immediately before the equipment is taken into or operated in a working place.

*b. Electrical equipment should not be taken into or operated in any place if methane can be detected by a competent person in the general air of the place with a permissible flame safety lamp, or if methane can be detected in amount of more than one-half of 1 percent by an electric methane detector. By "air of the place" is meant air not nearer than 1 foot from the face.

*c. If methane can be detected in holes in the roof with a permissible flame safety lamp or in amount of more than 1 percent by an electric methane detector, electrical equipment should not be taken into or operated in place until the pocket of gas has been removed by additional ventilation.

*d. When electrical equipment is used in face regions, tests for methane should be made at least every 30 minutes by a certified official or other competent person.

e. Replaced equipment, so far as feasible, should be of permissible type.

*52. Electrically driven permissible equipment should not be take into or operated in any place if methane can be detected with a permiss flame safety lamp or in amount of more than 1 percent with an electric methane detector.

53. If electrically driven permissible equipment is operated in f regions in a gassy mine, the place should be carefully examined for me

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d tests made every 30 minutes by a certified official or other compe-
nt person.

*54. Permissible equipment should be maintained in a good state of pair and in permissible condition, as determined by a rigid examination ch week by a person well-informed in the safe use of electricity under-ound and in the maintenance of equipment; a record should be kept of e defects found and how they are remedied. Repairs should not be made the electrical parts opened at or near the face while the power is on e machine or cable.

55. In gassy mines, permissible junction or distribution boxes should used, where feasible, in making power connections at working faces.

*56. Cables for portable or semiportable underground electrical uipment should be provided with suitable taps equipped with fuses, unless operly connected to permissible junction or distribution boxes.

57. Temporary cable splices should be made in a workmanlike anner, mechanically strong, and well-insulated; preferably, when a cable defective, a stand-by cable should be used and the defective cable sent the shop for permanent splicing and, if practicable, vulcanizing.

Note to inspectors: Temporary cable splices may be made as llows: (1) The conductors should be joined with proper splicing rings other suitable devices that will insure a good electrical and mechanical nnection. In concentric cables, the outside wires may be individually ned by splicing rings, twisting, or soldering. (2) The spliced conductors ould be reinsulated with rubber tape, preferably self-vulcanizing, so as have the same or greater dielectric strength as the original insulation, d the rubber on each conductor should be covered with P & B tape or its uivalent; both conductors should be covered with rubber tape and finished th P & B tape, or its equivalent.

Permanent cable splices may be made as follows: (1) The con-ctors should be joined with proper splicing rings or other suitable vices. (2) Splices should be properly vulcanized.

58. Permanent cable splices should be made by competent persons surface or underground repair shops.

59. To prevent excessive heating, the trailing cables or equipment ed in conveyor mining should be suspended in long loops rather than ntly coiled.

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*60. Portable pumps and other portable electrically driven equipment should be so located and installed as to constitute the minimum possible fire or man-contact hazard. They should be used only in well-ventilated places.

61. Electric lights on the slope or shaft bottom should be on a separate circuit from the trolley circuit if practicable.

62. Electric-light circuits should be provided with adequate fuses.

63. Electric-light wires should be supported by suitable insulators and connected to the trolley or power line with clamps.

64. The ground connection for lighting wires taken off the trolley circuit should be made to the track circuit.

65. Electric lights should be so placed that they cannot come in contact with combustible material.

66. Electric lights should not be used at or near any working face unless of permissible type.

67. Lamp sockets with exposed metal parts should not be used unground.

19. Machinery and Safety Appliances in Connection Therewith

01. Mining machines should not be loaded on their trucks or moved unless they are equipped with adequate locking devices on the cutter cha and the exposed bits at the end of the cutter bar guarded or removed.

02. To prevent injury from side slip of caterpillars from rail, the operator of a caterpillar machine should ride on the step provided for th purpose when moving from place to place.

03. Machinemen, drillers, and loading-machine operators should operate their equipment when any persons are in such proximity as to be endangered.

*04. Rock drilling with percussion drills should be done wet. Men drilling rock with auger-type drills should wear either approved-type respirators or use water, if dust is produced.

05. Machinery and belting exposed to possible personal contact should be guarded adequately as indicated below:

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a. Gears, sprockets, friction devices, and couplings with protruding bolts or nuts should be completely guarded.
b. Shafting and projecting shaft ends within 6 feet of floor or platform level should be completely guarded.
c. Vertical or inclined belt, chain, or rope drives should be suitably guarded to a height of at least 7 feet above the floor.
d. Horizontal belt, chain, or rope drives within 7 feet of floor or platform should be guarded.
e. Flywheels should be guarded. Where flywheels extend more than 6 feet above the floor, they should be guarded to a height of at least 6 feet.
f. Circular and band saws and planers should be adequately guarded.
g. Locomotive pits should be properly guarded and guard kept in place when the pit is not in use.

06. Surface machines should be adequately illuminated.

07. Adequate clearance should be provided at machine installations and passageways kept free of stumbling hazards.

08. Machinery should not be repaired while in motion or oiled while it is in motion, unless such oiling can be done without danger to the oiler.

09. A guard or safety device removed from any machine should be replaced before the machine is put in operation.

10. Mechanically operated grinding wheels should be equipped with:

a. Safety washers.
b. Substantial retaining hoods, the throat openings of which do not expose more than a 90° segment of any wheel. Preferably, not more than a 60° segment should be exposed.
c. If grinding operations are frequent or constant, a dust-collecting system should be installed to remove liberated dust, or a permissible respirator should be worn by the operator.

*11. Welders and helpers should be provided with proper shields to protect their eyes.

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*12. Stationary welding locations should be well ventilated and shielded.

13. Adequate tools should be available in working places; these should be maintained in good condition.

14. Hand tools should be kept in good condition.

15. If axes are used underground, the combined length of the ax a handle should not exceed 18 inches.

20. Fire Protection Underground

*01. Underground storage places for lubricating oil and grease sh be of fireproof construction.

*02. Lubricating oil and grease kept in face regions or other wor locations should be in portable, closed, metal containers.

*03. Inside structures (substations, shanties, stables, pump room etc.) should be of fireproof construction, including doors. Where the fi proofing material is in contact with timber or coal, it should not be of metal.

04. Welding and cutting (with electricity or flame) in gassy mine face regions and on returns should be done under the immediate super- vision of a certified official. No welding or cutting should be done if m than one-half of 1 percent methane is present. In all welding and cuttin operations, special precautions should be taken against starting a fire.

21. Miscellaneous Hazards

*01. An accurate map of the mine, brought up to date at least eve 6 months, should be available at the mine and should show accurately:

a. Openings and plan of workings of each vein of coal, and the tunnels and passageways connecting the workings.
b. General inclination, in degrees, of the veins of coal.
c. Elevations, above and below sea level, of top and bottom of shafts, slopes, tunnels, and other permanent stations.
d. Boundary lines and barrier pillars.
e. Locations and elevations of sumps, dams, and other impounded water.

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02. A ventilation map should be provided and should show:

a. Direction of air currents passing through tunnels, slopes, gangways, airways, cross headings, and working places, by arrows in colors wherever feasible.
b. Location of doors, overcasts, and regulators.
c. Location of telephones, power and trolley lines, and permanent electric equipment.

*03. When a limit of 200 feet is reached from abandoned workings that cannot be inspected or workings that are filled with water (not in excess of a 150-foot head) or gas, boreholes should be kept at least 20 feet in advance of the face; similarly, 45° angle holes, at least 25 feet deep and not more than 8 feet apart, should be made in each rib. If the head of water exceeds 150 feet, the depth of the boreholes should be increased 1 foot in length for each additional 10-foot head of water.

*04. When a place is being driven to connect with any working place or with any accessible idle or abandoned place, the condition of these places should be determined to be safe before the connection is made.

05. Main slope and drift openings should be separated by at least 20 feet of natural ground. (Inspector: This applies only to future openings.)

06. In regard to mine openings:

*a. Every underground mine should have at least two separate outlets to the surface.
*b. Each bed of coal and each level or entry therein should have at least two travelable openings in connection with (directly or indirectly) both main outlets to the surface.
*c. It is not necessary that the two main outlets belong to the same mine if persons can travel safely to, and out of, either outlet from either mine.
*d. When a new mine is being opened or when a new entry or level is being worked for the purpose of making a connection between the two main outlets, not more than 20 persons should be allowed at any one time in such mine, entry, or level.
*e. When only one main outlet is available, due to the final mining of pillars, not more than 20 persons should be allowed in any such section or in any such mine at any one time.

07

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*07. Designated escapeways should be readily accessible from ever section of the mine and should be kept in a safe condition, reasonably free from steam, dangerous gases, standing water, ice, and other obstructions

08. Designated escapeways should be of sufficient height and width to allow men to travel safely.

09. Direction signs should be posted conspicuously to indicate trav ing ways and designated escapeways.

*10. If the designated escapeways are shafts:

*a. They should be equipped with hoist and cage, or with a travelable stairway.

*b. If equipped with stairway, it should be of substantial construction, set at an angle not greater than 45° with the horizontal, and equipped on at least one side with suitable handrail; landing platforms should be at least 2 feet wide and 4 feet long at easy and convenient distances, and should be railed properly.

*c. If the shafts are not more than 30 feet deep, a ladder may be used in lieu of a stairway. Such ladders should be fastened securely. The rungs should be fastened securely, spaced equally, and not more than 15 inches apart.

*d. Ladders or stairways should be kept in good repair, with landings free of debris.

*11. If a designated escapeway is a slope of more than 30°, it shou be equipped with stairway or ladder and have landings at intervals not t exceed 50 feet.

12. If a designated escapeway is a drift or a slope inclined less t 45° from the horizontal, incombustible walls (or lining) should extend a least 200 feet from the entrance. If such designated escapeways do not meet these requirements, adequate fire protection should be provided.

13. If but one way of escape has incombustible walls or lining, it should be the normal intake airway.

*14. Manways and travelways should be provided where practicable they should be maintained in good condition, reasonably free of ice, wate and other obstructions; employees should use them.

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15. All surface openings to underground workings that are not necessary for the operation of the mine should be kept securely closed to prevent unauthorized persons entering, but they should be locked in such a way as not to prevent the escape of employees in an emergency.

16. All openings necessary for operation of a mine or for escape should be guarded against unauthorized entrance of persons, but so as not to prevent the escape of employees in an emergency.

*17. A check-in- and-out system should be adopted that will provide positive identification, upon the person, of every individual underground. An accurate record of the men in the mine should be kept in a place that will not be affected in the event of an explosion.

18. Barrier pillars should be left when workings are adjacent to old workings suspected of containing water, bodies of dangerous gas, or fire; the barrier pillar should be of such width as may be determined by the engineers of the adjoining property owners and the State mine inspector of the district in which the mine is situated.

19. In pitching coal veins, pillars of adequate thickness should be left to support levels and gangways.

20. Underground stables should be ventilated by separate splits of air, with vents to the return air courses.

*21. Hay or straw should be stored in a fireproof structure apart from the stable.

*22. Smoking should not be permitted in any mine.

23. Search of employees for smoking material, matches, and other lighting devices should be made frequently and in a manner to assure that such articles are not being carried into the mine.

*24. Only permissible portable electric lamps, preferably cap lamps, should be carried by all persons for illumination in the mine.

*25. Protective hats should be worn by all employees, officials, and others while on duty in mines and also in work on the surface where there is danger from falling objects.

*26. Protective footwear should be worn by employees, officials, and others while on duty in and around mines.

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27. Gloves should be worn when material is handled that may injur the hands.

*28. Men should be required to wear safety goggles when using grin ing tools and when doing other work where particles are likely to fly. Pr erably, all mine employees should wear goggles at all times in and arou mines. Where corrective-lens goggles are needed, they should be used.

29. Haulagemen and others who work around machinery should wea snug-fitting clothing and have trouser legs held with boots or puttees, tucked inside socks, or otherwise fastened. When electric cap lamps are worn by such employees, the lamp cables should be concealed under their clothing.

GENERAL SAFETY CONDITIONS

22. Supervision

01. The foreman or other person in charge of underground opera-tions, and all assistant foremen should have certificates of competency from the State.

02. Records of foremen's certificates should be kept at the mine.

*03. Each working place should be inspected for safety by a certifi official at least twice each working shift and as many more times as ma be necessary. A sufficient number of officials should be employed to ca out this recommendation.

*04. Idle or abandoned sections of a mine should be inspected for g and other dangerous conditions by the foreman or assistant foreman im-mediately before other employees are permitted to enter such sections, to assure the safety of the workmen.

*05. Air courses should be traveled at least once each week by a c tified mine official, who should leave his initials and the date; air cours that might be used as escapeways in case of emergency should be inspe and defective conditions remedied promptly.

06. All underground entrances to any places not in actual course working or extension should be properly fenced across the whole width such entrances to prevent persons from inadvertently entering them.

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*07. All entrances to dangerous places should be fenced off and suitable danger signs provided at safe distances from the existing hazard.

*08. A statement of all dangerous conditions observed should be recorded daily in a book, signed and dated by the mine foreman.

23. Safety Organization

01. Safety engineers or directors should be employed for mines employing 150 persons or more.

02. A safety organization of officials and employees should be established if practicable.

03. A safety committee, including workmen and officials, should make periodic inspections of the mine and submit recommendations for correcting hazards observed.

*04. Accidents involving injuries to persons and other serious accidents should be investigated and records kept of such investigations.

05. Responsibility for accidents should be placed, if it is feasible to ascertain such responsibility.

06. Records should be kept of all lost-time accidents, and they should be summarized monthly, as well as annually, and studied with a view to making needed corrections in practice.

07. Joint safety meetings of men and officials should be held at least monthly if practicable.

08. A bulletin board should be provided and posted with suitable bulletins, if available.

24. Safety Rules and Standards

01. Special company rules regarding mine safety should be adopted and published; they should be approved by the State agency governing mining where such approval can be obtained.

02. New employees should be fully instructed regarding the company safety rules and regarding the particular hazards incident to their work; this applies to both experienced and inexperienced personnel.

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03. Where practicable, new employees should be furnished with copies of the mine safety rules.

04. Employees should become conversant with the State mining law with the aid of such instruction and assistance as may be obtained from the company or available educational agency. Compliance with the mining law should be required of all employees.

25. First Aid and Mine Rescue

01. All employees (underground and surface) should be given first-aid training as soon as possible after being employed.

02. If feasible, additional first-aid training should be given to all employees annually.

*03. Adequate first-aid material should be provided on the surface and underground and kept in clean, usable condition.

04. At least 10 sets of oxygen breathing apparatus and at least 6 gas masks and necessary accessories should be available in each mining district for use if a mine fire or explosion occurs. This equipment should be available at centrally located rescue stations owned by the State or operators in the districts, or be owned by individual companies. This equipment should be readily available at all times for transportation and use.

05. When training facilities are available, at least 12 men should be trained in mine rescue work at mines having more than 100 employees; mines having 100 employees or less should have a proportionately small number trained.

06. Additional mine rescue training should be given monthly if training facilities are available.

07. Mine officials should take an advanced mine rescue course when such course is available.

08. Self-rescuers should be readily available to all underground employees.

09. If self-rescuers are available, employees should be trained in their use. Self-rescuer cases should be maintained in airtight condition.

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